

Search Costs, Switching Costs and Product Heterogeneity in an Insurance Market

Harris Schlesinger
and
J. -Matthias Graf von der Schulenburg*

Abstract

An insurance market is modeled as a game with two types of players: incumbent insurers and new entrants. Insurer service-quality characteristics are examined as a Hotelling-type of spatial equilibrium. That is, insurers realize that consumers have varying tastes and choose differing product characteristics in order to carve out niches in the market. Insurers then set prices, cognizant of the prices of their competitors, modeled here as a Bertrand-Nash equilibrium. The addition of a cost to consumers for switching insurers is shown to give incumbents a degree of monopoly power in setting prices. Adding costly consumer price search further reduces the market share of new entrants. However, those consumers that do switch to a new insurer have strong preferences for that insurer and, as a result, it is possible that new-entrant prices will exceed those of incumbent insurers.

The existence of price dispersion in insurance markets is well-known. For example, Jung (1978) found a large discrepancy between the highest and lowest price quoted on an identical automobile liability policy in the city of Chicago. Similarly, Matthewson (1983) has shown that a large amount of price dispersion exists in the market for life insurance. Several models have been developed in order to explain this price dispersion in insurance markets. A recent paper by Berger, Kleindorfer and Kunreuther (1989), for example, considers price dispersion as a natural consequence of the diffusion of price information. Their model considers the market as being in disequilibrium. Most other models, however, show how price dispersion can persist in a long-run equilibrium, e.g. Dahlby and West (1986), Carlson and McAfee (1983) and MacMinn (1980).

The above models, with the exception of Berger, Kleindorfer and Kunreuther (1989), all focus on search costs as the *raison d'être* for price

*Harris Schlesinger is Professor of Finance and Frank Park Samford Chair of Insurance at the University of Alabama and a research fellow at the Wissenschaftszentrum, Berlin. Matthias Schulenburg is Professor of Economics at the University of Hannover and is also a research fellow at the Wissenschaftszentrum, Berlin. The authors wish to thank Bev Dahlby, David Schutte and two anonymous referees for helpful comments on an earlier draft of the paper.

dispersion. The purpose of the current article is to add two other factors into a model of price dispersion; namely product heterogeneity and switching costs.

Product heterogeneity is often overlooked because the insurance contracts that exist in many markets are either identical, or very nearly identical. For example, in their empirical study of the automobile insurance market in Alberta, Canada, Dahlby and West (1986, p.419) claim "... the insurance policy that we examine, compulsory third-party liability insurance, is homogeneous, making the premiums charged by different firms directly comparable." This view, which is quite prevalent in the literature, seems to equate the insurance contract with the insurance product. However, the insurance product is itself a service, and the quality and attributes of such a service can and do vary among insurers.

Cummins, et al. (1974) reports that 40 percent of over 2,400 individuals surveyed felt that the particular insurance company was the most important factor in choosing an automobile insurer. This compares to 27 percent who felt that price is the most important consideration. In another article, Schlesinger and Schulenburg (1990) find empirical evidence of perceived product heterogeneity in the West-German insurance market. These perceptions are also examined in a recent poll of 904 consumers by the Gallop Organization (summarized in *Best's Review: P/C Edition*, September 1989, pg. 11), which evaluates various service-quality characteristics.

The perceived quality of service is only one of the attributes that can distinguish between two seemingly identical insurance contracts. Probability of insurer insolvency, bonus/malus types of adjustments to annual insurance premiums, the convenience of the claims service, the availability of a local agent (or a 24-hour toll-free number?), the method-of-payment options; these are all examples of the types of attributes (or "characteristics") that can differ from one insurer to the next, even though the contracts themselves may be identical.

The other element added in the current theory of price dispersion is switching costs, as set forth by Williamson (1979). The idea is that consumers in certain markets, such as the insurance market, may incur some nontrivial costs for switching from one supplier to another. Such costs may include the cost of informing old insurers and other parties (e.g. lienholders) of the change, the cost of closing on the new contract, psychic costs of breaking long-term relationships, and the cost of learning any new procedures for dealing with claims or service representatives. These costs enable the supplier to exert a certain degree of monopolistic power over its current customers. Together with the assumption of product heterogeneity, these characteristics seem to imply a monopolistically-competitive environment, even if the number of insurers is quite large. Some recent attention has been given to the effects of switching costs on market structures, e.g. Klemperer (1987) and Farrell and Shapiro (1988). The concern in the present article is the effects of switching costs on equilibrium prices within an insurance market.

The model used is basically an extension of the model of Weizsäcker (1984), who labels switching costs as "costs of substitution." The model considers new insurance firms that enter an existing market. Weizsäcker's basic model is simplified while at the same time adding search costs to the process. Insurance prices and quantities are derived for a Bertrand-Nash equilibrium. In particular, it is shown that new market entrants are inhibited by search costs and switching costs, and they will, *ceteris paribus*, obtain a smaller market share than extant insurers. When there are only switching costs, without any cost of search, prices of the extant insurers will always be higher than those of new entrants, as was shown by Weizsäcker. However, when search costs are added to the model, it is possible to have new-entry insurers charging a higher price. In particular, this happens whenever the expected prices of new entrants are very high. In this case, only those consumers who would have a strong preference for the characteristics of the new insurer are prepared to pay the search costs necessary to determine the true price. As a consequence, the new entrant finds itself with fewer customers, but takes advantage of the strong preferences of those who do switch by charging a higher price.

Switching Costs and Product Heterogeneity

This section sets up a simple theoretical model showing how price dispersion may develop in a market with heterogeneous products and switching costs (but no search costs). The model is based on the well-known approach developed by Hotelling (1929), which has become one of the common tools for analyzing markets with monopolistic competition. The model used is a dynamic model in which existing firms have even more monopolistic power than in the usual models of monopolistic competition, stemming from the consumers' costs of switching to a (potential) new entrant. The consumer's insurance decision is simplified by assuming that the level of insurance coverage is fixed and that all consumers purchase one insurance contract per period. The consumer is allowed to purchase the contract from any insurer in the market.

The model is basically an extension of the switching-cost models of Weizsäcker (1984) and Schulenburg (1987). Consumers are located along a circular street in a preference space for product characteristics.¹ To keep the analysis simple, further assume that the "length" (i.e. circumference) of the circular street is one and that consumers (i.e. consumer tastes) are uniformly distributed along the street. The location of a particular consumer along the street describes his or her preferences for product characteristics in the insurance market (see Lancaster (1966) and Rosen (1974)). There are n

¹ The main results of the model do not change with the use of a linear street, as in Weizsäcker. This would also allow one to interpret location as a measure of "quality." However, location seems to better represent subjective product heterogeneity than it does a linear quality measure. The use of a circular characteristic space is somewhat arbitrary. It is used here for its simplicity, since the metric (distance function) used is rather natural. More specifically, the space of characteristics is the unit sphere in R^2 , with the weak topology.

consumers where n is sufficiently large to approximate the economy with a continuum of consumers.²

Except for their location in the product-characteristics space, consumers are assumed to be identical. Each consumer buys one insurance contract in each period over a planning horizon of T periods. Consumer disutility is assumed to be linear in price and distance in product-characteristics space, where distance is measured along the circumference of the street. In particular, assume the total disutility cost for buying an insurance policy from insurer i is

$$v(i) \equiv p_i + qd_i, \quad (1)$$

where $p_i \equiv$ price of insurer i (assumed measured in units of disutility)

$d_i \equiv$ distance of consumer from insurer i in product-characteristics space.

$q \equiv$ utility loss per unit distance, $q \geq 0$.

If $p_i = d_i = 0$, the consumer is at a bliss point, receiving his or her most preferred insurance characteristics for free.³ If $q = 0$, product characteristics are perfectly substitutable and consumers buy from the lowest-price insurer. For the ensuing analysis, it is assumed that $q > 0$.

There are $m/2$ established insurers in the market place, where $m/2$ is a positive integer. Insurers are assumed to have no fixed costs and a constant marginal cost of c per insurance contract, which is identical across insurance firms.

Firms set their prices to maximize profits,

$$\pi_i = p_i x_i - c x_i, \quad (2)$$

where x_i denotes the quantity demanded (i.e. number of consumers who purchase contracts) from insurer i . The quantity demanded is determined by multiplying market share times the number of consumers, n , and is affected by the set of prices in the market.

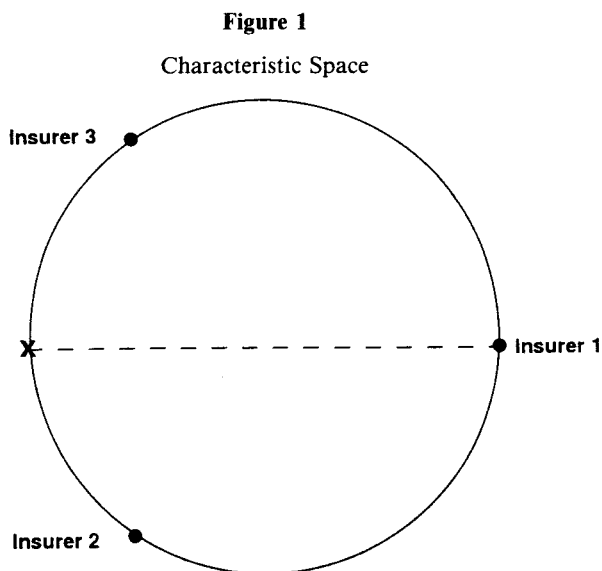
To determine market share, consider a typical consumer located between two insurers in the product-characteristics space. The consumer buys from the insurer with the lowest total disutility cost, $v(i)$. Thus, the marginal consumer located between insurers i and j is the one for whom $v(i) = v(j)$. It is not difficult to show that, given the symmetry in the current model, a Bertrand-Nash equilibrium obtains when insurers locate equidistant along the circular street, at a distance of $2/m$ from one another, and each charges a

²This assumption allows the further assumption that a consumer is located "near enough" to any particular point in the characteristics space. It also allows one to assume that firm demand is equal to market shares times n .

³Actually, the consumer would minimize the sum of discounted disutility costs over the planning horizon. However, since the insurer chosen today is maintained until time T in the model, it is sufficient for the consumer to minimize $v(i)$.

price of $p_i = (2q/m) + c$.⁴ This is illustrated in Figure 1 for the case where there are three insurers ($m = 6$).

In Figure 1, each insurer is located equidistant around the circular characteristic space. Consumers are located uniformly around the circle. It may help the reader to think of each insurer as being pure in one of three attributes (although this assumption is only for illustrative purposes). The point on the circle labeled "X" is the farthest point (measured along the circumference) from insurer 1's location, and thus has the least amount of attribute 1 as any point along the circle. It also has equal amounts of attributes 2 and 3, being equidistant to the locations of insurers 2 and 3. Since prices are equal for all three insurers, a consumer with tastes located at X would be indifferent between insurers 2 and 3. A consumer located slightly below X in Figure 1 would thus choose insurer 2, whereas one slightly above X would choose insurer 3.



Now suppose that a new generation of $m/2$ additional insurance firms enter the market. Any location decision by new entrants in product-characteristic space, other than locating evenly between the established insurers, is easily shown to be dominated.⁵ Assume that consumers know the location of the new insurers and, for the time being, that prices are also known. Given the

⁴For a general version of this result, see Novshek (1980). A Bertrand-Nash equilibrium is a price-setting version of the more commonly known Cournot-Nash equilibrium. The Bertrand-Nash equilibrium assumes each insurer sets a price, while assuming all other insurers will maintain their prices.

⁵Unlike Farrell and Shapiro (1988), the population of consumers is constant and unlike Weizsäcker (1984) tastes are time invariant.

symmetries in the model, it will be convenient to refer to established insurers as A-type insurers and new entrants as B-type insurers.

A consumer located between a particular A-type and B-type insurer will switch insurers and buy from the B-type insurer if and only if

$$p_B + qd_B + ak < p_A + qd_A, \quad (3)$$

where ak is the amortized cost of switching to a new insurer; i.e. k is the switching cost incurred at the time of the switch and

$$a \equiv 1 / \left\{ \sum_{t=0}^T (1+r)^{-t} \right\}, \quad (4)$$

where r denotes the consumers' rate of discount. If consumers have an infinite planning horizon ($T = \infty$), then $a = r$.

Given the equal spacing of insurers, equation (3) is equivalent (since $d_A + d_B = 1/m$) to

$$p_B < p_A + [(1/m) - 2d_B]q - ak. \quad (5)$$

For the marginal consumer, i.e. the consumer indifferent to switching,

$$d_B = [p_A - p_B + (q/m) - ak] / 2q. \quad (6)$$

Since each type B insurer has two A-type "neighbors," and since the street length is normalized at one, the market share for each type-B firm is $2d_B$, which implies a demand of

$$x_B = (n/q)[p_A - p_B + (q/m) - ak]. \quad (7)$$

Similarly, the demand for each A-type insurer is easily shown to be

$$x_A = (n/q)[p_B - p_A + (q/m) + ak]. \quad (8)$$

Using (7) and (8) in equation (2) and assuming a Bertrand-Nash type of conjecture about rival pricing, it is straightforward to obtain the following equilibrium prices and quantities.

$$p_A^* = c + (q/m) + (ak/3)$$

$$p_B^* = c + (q/m) - (ak/3)$$

(9)

$$x_A^* = (n/q)[(q/m) + (ak/3)]$$

$$x_B^* = (n/q)[(q/m) - (ak/3)]$$

Note that if $q/m < ak/3$, then B-type insurers lose money and would not enter the market. It is assumed that k is small enough so that this inequality does not hold.

Costly Consumer Search

In this section, the assumption that consumers know the price charged by new entrants is dropped. Rather, consumers are assumed to know the number

of new entrants and that they optimally locate midway between incumbent insurers, but do not know the prices charged by new entrants. The simplifying assumption of linear disutility in price and distance now allows the modeling of consumer choice based on only the mean of expected prices, $\bar{p}_B$, which is assumed to be exogeneously given and homogeneous among consumers.⁶

Given a capitalized cost of search, s , which once invested reveals the true price of B-type insurers, consumers will invest in a price search if and only if

$$\bar{p}_B \leq p_A + [(1/m) - 2d_B]q - a(k + s). \quad (10)$$

If a consumer decides to search, he or she will then switch insurers if and only if the revealed price of B-type insurers satisfies equation (5). One can think of $k + s$ as a total cost of switching insurers, but with the consumer having the option to abandon the switching decision after learning the true price, p_B . In this setting, one can view s as a sunk-cost portion of the total switching cost.

From (5) and (10), it follows that (9) holds as an equilibrium whenever

$$\bar{p}_B \leq c + (q/m) - (ak/3) - as. \quad (11)$$

Since this condition is referred to frequently, let p_s denote the right-hand side of (11). When (11) holds, the search constraint (10) is nonbinding for the marginal consumer. However, since the switching rule (5) treats s as a sunk cost, the cost of search does not enter into the equilibrium prices as given by (9).

This all changes when (11) does not hold. In this case, the consumer who would be the marginal consumer absent any search costs now finds it too costly to search, given current expectations about B-type prices. Thus, the equilibrium market share of B-type insurers will be lower than it would be otherwise. As a constrained maximum, B-type insurers set their prices to take as much of a market share as possible,

$$p_B^* = \bar{p}_B + as. \quad (12)$$

Thus, the marginal consumer who searches (and satisfies condition (10) with equality) is also at the margin with regards to switching, as determined by (5). Any higher price than given in (12) would reduce market share and is easily shown to decrease profits. Any lower p_B would not increase market share and would thus also lower profits.

A-type insurers, realizing the effects of price expectations and search costs, now become Stackelberg-like price leaders and set their prices optimally at

$$p_A^* = \frac{1}{2} [\bar{p}_B + c + (q/m) + a(k + s)]. \quad (13)$$

⁶The model is thus much more simplistic than models in which the entire distribution of price expectations is used in the search decision, such as MacMinn (1980). The informational assumption is also reflective of real-world insurance advertising, which seems to be geared at service characteristics and is usually not very informative about prices. Readers should note that unlike most search models, all new entrants charge the same price. This fact is known by consumers, but they must pay search costs in order to determine what this price is. Otherwise, they know only the expected price of B-type insurers.

Note that, for situations in which $\bar{p}_B > p_s$, the cost of search, s , enters into the equilibrium pricing strategies of both A-type and B-type insurers.⁷

Using the demand equations (7) and (8), one can solve for the equilibrium quantities demanded when $\bar{p}_B > p_s$,

$$\begin{aligned} x_A^* &= \frac{1}{2} (n/q) [(q/m) - c + a(k+s) + \bar{p}_B] \\ x_B^* &= \frac{1}{2} (n/q) [(3q/m) + c - a(k+s) - \bar{p}_B]. \end{aligned} \quad (14)$$

The Nash-equilibrium is thus fully defined by (9) whenever $\bar{p}_B \leq p_s$, and by (12), (13) and (14) when $\bar{p}_B > p_s$. The equilibrium prices and quantities, in relation to the expected price, $\bar{p}_B$, are illustrated in Figures 2 and 3.

Figure 2

Nash Equilibrium Prices

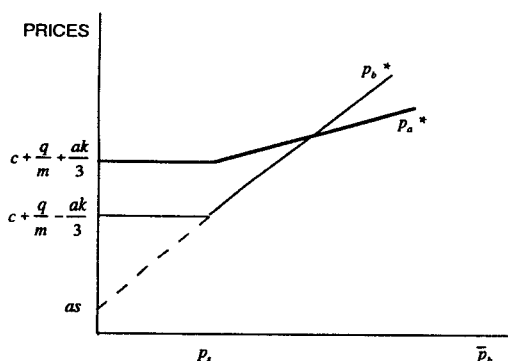
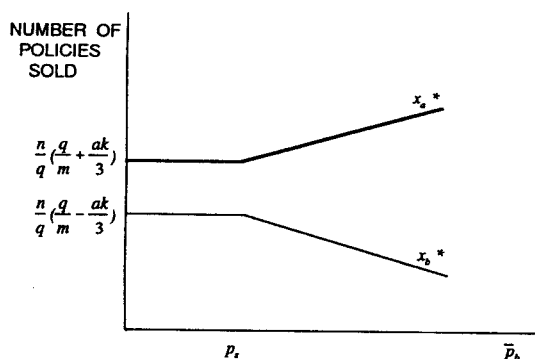


Figure 3

Nash Equilibrium Quantities



⁷Stackelberg price leadership occurs when one firm knows how the others will react to its change in price. In the current model, the A-type insurers know that new entrants will base their prices on the extant prices, and set their prices with this reaction in mind.

In Figure 2, both types of insurers charge higher prices whenever the expected price of B-type insurers exceeds p_s , i.e. whenever condition (11) is not satisfied. It is interesting to note that, for $\bar{p}_B$ high enough, the direction of price dispersion reverses itself and p_B^* exceeds p_A^* . In particular, this occurs whenever $\bar{p}_B > c + (q/m) + a(k-s)$. As $\bar{p}_B$ rises, the number of consumers deciding to search declines and, thus, the marginal consumer is located nearer to the B-type insurer in the product-characteristics space. The new marginal searcher has a higher willingness to pay, which is taken advantage of by the B-type insurer. Of interest here is that, whenever $\bar{p}_B = c + (q/m) + a(k-s)$, there is no price dispersion in equilibrium. In other cases, the level of price dispersion is monotonically related to how much the actual price expectations differ from this level.

Figure 3 illustrates that, whenever the search cost constraint is binding (i.e. $\bar{p}_B > p_s$), the market share of A-type insurers rises while that of B-types declines. The combination of higher prices and higher volume clearly yields higher profits to A-type companies, π_A . For B-type companies, it follows trivially from (12) and (14) that

$$\partial \pi_B / \partial \bar{p}_B > 0 \text{ iff } \bar{p}_B < c + \frac{1}{2} (3q/m) - \frac{1}{2} ak - as, \quad (15)$$

where π_B denotes profit.

Since it is assumed that $(q/m) - (ak/3) > 0$, comparison of (15) and (11) shows that $\partial \pi_B / \partial \bar{p}_B$ is positive for price expectations slightly above p_s .⁸ Consequently, to the extent that both types of insurers can influence price expectations, both insurers would like to see an expected $\bar{p}_B$ higher than p_s . Conflicts of interest arise, however, if expected B-type prices go too much higher. Type-A insurers would like consumers to expect new-entrant prices to be as high as possible, whereas B-type insurers attain the highest profits when $\bar{p}_B = c + \frac{1}{2} (3q/m) - \frac{1}{2} ak - as$.⁹

Concluding Remarks

The authors of this article have shown how product heterogeneity, costs of search and costs of switching insurers affect prices in an insurance market. The model is much simplified, but shows how these factors can lead to equilibrium price dispersion.

In a more realistic setting where insurers are continually entering (and leaving) the market, consumers might wish to postpone switching, even if they find an insurer with a price low enough to make switching worthwhile. The reason is that the consumer may encounter yet another new insurer with an even lower price in the near future. While jumping to the lowest-priced insurer,

⁸Note that the two middle terms on the right-hand-side of the inequality in (15) equal $(3/2)[(q/m) - (ak/3)]$. See also the discussion following (9).

⁹Comparative statics are performed quite easily although they are not a focus of the article. Interested readers can easily derive static results for themselves.

ceteris paribus, might be an optimal move if made with one switch, it might be suboptimal if consumers must pay the switching costs more than once to get there. Thus, some type of option value for delaying a switch would need to be added to the direct switching costs.

In the present model it was also assumed that product characteristics were known in advance of purchase by the consumer. In reality, insurance quality is not only unobservable prior to purchase of a policy, it is also likely to be learned only as one "experiences" the insurance product.¹⁰ Thus, some insurer switching might occur as consumers learn that they have incorrectly assessed the characteristics of their own insurer.

Consumers are also not likely to be homogeneous in the sense of having identical switching costs or search costs. If switching costs differ, insurers will raise their prices if the increase in monopoly rents over the high-switching-cost clients more than offsets the loss of profits from low-switching-cost clients. If search costs differ, new-entrant insurers may attract mostly low-search-cost clients, who are then not as likely to remain very long with the company.

While all of these factors are certainly important, they are beyond a detailed analysis in the current article. They also complicate any empirical testing of the model. However, some supporting evidence does exist. Berger, Kleindorfer and Kunreuther (1989), for example, find that consumers who switch automobile insurers mostly switch from firms with very high prices to firms with very low prices, with no noteworthy movement in the middle range. This evidence supports the existence of switching costs. Schlesinger and Schulenburg (1990), find that consumers are likely to become "informed consumers" prior to switching, thus evidencing a search step ("becoming informed" in this case) in the switching decision. Although the present model is somewhat simplistic, it should at least point to the important roles played by product heterogeneity, search costs and switching costs in determining the market price of insurance. It is hoped that future research might build upon this framework.

References

- Berger, Larry A., Paul Kleindorfer and Howard Kunreuther, 1989, A Dynamic Model of the Transmission of Price Information in Auto Insurance Markets, *Journal of Risk and Insurance*, 56: 17-33.
- Carlson, John A. and R. Preston McAfee, 1983, Discrete Equilibrium Price Dispersion, *Journal of Political Economy*, 91: 480-93.
- Cummins, J. David, Dan M. McGill, Howard E. Winklevoss and Robert A. Zelten, 1974, *Consumer Attitudes Toward Auto and Homeowners Insurance* (Philadelphia, Department of Insurance, Wharton School, University of Pennsylvania.)

¹⁰Such goods are referred to as "experience goods." See Shapiro (1983). This might be particularly appropriate in insurance markets where many insurer attributes, such as claims processing efficiency, are not observable until one experiences a loss.

- Dahlby, Bev and Douglas S. West, 1986, Price Dispersion in an Automobile Insurance Market, *Journal of Political Economy*, 94: 418-38.
- Farrell, Joseph and Carl Shapiro, 1988, Dynamic Competition with Switching Costs, *Rand Journal of Economics*, 19:123-37.
- Hotelling, Harold, 1929, Stability in Competition, *Economic Journal*, 39: 41-57.
- Jung, Alan F., 1978, Automobile Insurance Rates in Chicago, Illinois, *Journal of Risk and Insurance*, 45: 507-15.
- Klemperer, Paul, 1987, Markets with Consumer Switching Costs, *Quarterly Journal of Economics*, 102: 375-94.
- Lancaster, Kelvin J., 1966, A New Approach to Consumer Theory, *Journal of Political Economy*, 74: 132-57.
- MacMin, Richard D., 1980, Search and Market Equilibrium, *Journal of Political Economy*, 88: 308-27.
- Matthewson, G. F., 1983, Information, Search and Price Variability of Individual Life Insurance Contracts, *Journal of Industrial Economics*, 32: 131-48.
- Novshek, William, 1980, Equilibrium in Simple Spatial (or Differentiated Product) Models, *Journal of Economic Theory*, 2: 313-26.
- Rosen, Sherwin, 1974, Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition, *Journal of Political Economy*, 82: 34-55.
- Schlesinger, Harris and J.-Matthias Graf von der Schulenburg, 1990, Consumer Information and the Purchase of Insurance. WZB Working Paper, Berlin.
- Schulenburg, J.-Matthias Graf von der, 1987, "Marktgeschehen bei unvollständigen Nachfragerinformationen, *Zeitschrift für Betriebswirtschaft*, 57: 699-19.
- Shapiro, Carl, 1983, Optimal Pricing of Experience Goods, *Bell Journal of Economics*, 14: 497-507.
- Stigler, George, 1961, The Economics of Information, *Journal of Political Economy*, 69: 213-25.
- Weizsäcker, Carl Christian von, 1984, The Costs of Substitution, *Econometrica*, 52: 1085-116.
- Williamson, Oliver E., 1979, Transaction-Cost Economics: The Governance of Contractual Relations, *Journal of Law and Economics*, 22, 233-62.

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